

## Minutes of Radiation Safety Sub-Committee of February 26, 2001

## Review of E951 (A3 Line) Expected Radiation Levels

**Present:** I.H. Chiang, G. Greene, G. Herman (RCD), R. Karol, R. Prigl, J. Scaduto, A. Stevens

1. Agenda

The subcommittee met at the request of the RSC Chair to review the following items for the A3 Line, experiment E951:

- a) Estimated radiation levels outside the shield during normal operation
- b) Estimated radiation levels when the beam is at limits of the current comparators
- c) Estimated radiation levels when the beam is totally miss-steered
- d) Locations where TLDs should be placed during the run in order to provide useful dose information

2. Computed Radiation Levels Outside Shield During Normal Operation

Estimates were made by R. Prigl with the computer code N-SHIELD.

The computed dose rates outside the shield with a 24 GeV proton beam were determined to be acceptable, given the prescribed limits from the RSC Meeting Minutes from 2/13/01. The prescribed limits at the shield surface were 2.5 mrem/hr in general with 10 mrem/hr at a hot spot and 100 mrem/hr on the roof.

The general area dose rates at the east and west shield faces are  $<1$  mrem/hr for both thin and thick targets. The worst reported cases were about 4 mrem/hr on the east A3 shield wall in Building 912 and about 70 mrem/hr on the roof at the building wall interface. The former level corresponds to a thick target with  $10^{14}$  protons/hr (see figure A-6 in attachment) and the latter to a thin target with  $10^{15}$  protons/hr (figure A-10 in attachment).

At the sides of the shield where the cave ends and the beam stop begins (at the Building 912 outer wall), there is a narrowing of the side shielding due to the building configuration. The 4 mrem/hr estimate mentioned above is at the position of this 'hot spot', but a recess in the shield was not simulated in the calculation. These areas (about a foot wide, vertically up the shield from floor to cave roof) may therefore experience levels that exceed 10 mrem/hr at the shield face.

Radiation surveys during tuning/fault studies shall determine if these recessed areas need to have additional shielding or need to be roped-off at the 10 mrem/hr line. The LP should determine the

necessary solution during initial tuning phases (for both thin and thick targets) of E951 and obtain the RSC Chair approval if the area needs to be roped-off (**CK-A3-2001-232**).

Access to the roof during operation will be prohibited. This is assured by the fact that, even if someone violated radiation signs and climbed over locked stair gates, they would have to climb a step in the roof shield that is 6 foot high to gain access to the higher dose rate areas.

3. Radiation Levels When the Beam is at Limits of the Current Comparators or When the Beam is Totally Miss-steered

Location of the five chipmunks, as presented at the 2/13/01 meeting, was reviewed in order to assure that they could respond to expected beam faults. It was noted that there will be beam loss monitors along the east and west walls inside the A3 Target Cave and SWICs in the beamline near A3Q5 and A3Q8. These will be used to efficiently tune the beam.

As beam wanders from the nominal A3 beam line, the first object struck is the A3Q8 quad immediately in front of the target location. Two of the chipmunks are at 90 degrees to this object, over a cable trench.

If the beam wanders further, the next object, which would be struck is the A3Q5 quad. The worst-case dose rate for this fault would be about 30 mrem/hr (using figure B-7 and assuming the thin target beam limit of  $10^{15}$  protons/hr) at the east side of the shield at the trench. Examination of the shielding downstream of the

A-line dump indicates that this value (30mrem/hr) is likely the worst case or very nearly so.

If the beam would wander further still, it would scrape on the downstream end of the A-line dump. Finally, with all of the A3 line bending magnets off, it would be buried in the A-line dump.

There is an existing A2 chipmunk located near the west wall of the cave, which will “see” faults or excessive beam scraping in the collimator due to miss-steering or malfunctions of the A1D4 magnet.

The five chipmunks to be used for the A3 Cave are configured such that one is on the roof, two are at the location where the side shields are thin (at the cave to beam stop location at the Building 912 walls), and two, as noted above, are located about 90 degrees from the beam line at the target location. In order to assure that the two chipmunks at the 90-degree locations can “see” upstream faults from beam interactions in the A3Q5 region, the chipmunks should be placed about 6 feet from the west shield wall and 3 feet from the east shield wall at the trench position. LP to verify proper chipmunk placement (**CK-A3-2001-233**).

Fault studies are to be performed after initial tuning of the beam. The SWICs can be used to create faults in the region near the quads noted above (**CK-A3-2001-234**).

4. Locations Where TLDs Should be Placed to Provide Useful Dose Information During the Run

TLDs are not required for personnel safety because periodic radiation surveys will be conducted by RCTs.

In order to get an accurate dose history during the run which can be used for future E951 runs at higher intensities, three TLDs will be placed as follows:

- a) southeast corner of the A3 Experimental Trailer, outside of Building 912
- b) the RCT office in Building 912 north of the beam dump

c) at the outside face of the dump (at the height of the beam in the parking lot)

G. Herman will verify the placement of these TLDs prior to the start of the run (**CK-A3-2001-235**).

**Attachment:**

Copy of transparencies shown by R. Prigl (dated 2/26/01) at Subcommittee meeting.

Distribution:

Attendees

RSC Membership

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